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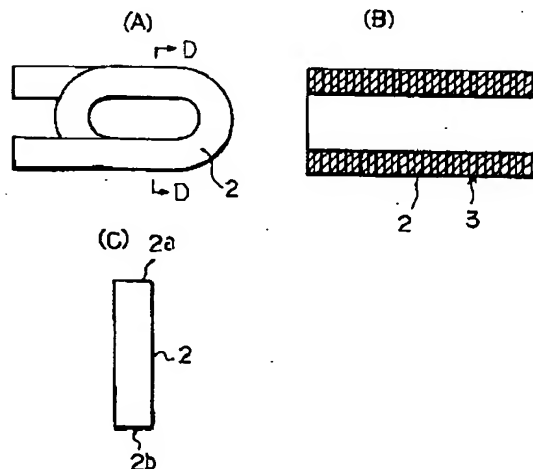
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(54) 【発明の名称】 コイル部品

(57) 【要約】

【課題】 薄型化したコイル部品を提供する。

【解決手段】 平角銅線2を用い、該平角銅線2の狭幅面がコイル3の内周、外周面となり、かつ、断面が略長円形となる筒状に形成する。



2 : 平角銅線、3 : コイル

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【特許請求の範囲】

【請求項1】平角銅線を用い、該平角銅線の狭幅面がコイルの内周、外周面となり、かつ、断面が略長円形となる筒状に形成したことを特徴とするコイル部品。

【請求項2】請求項1の断面形状が略長円形のコイルを高圧出力巻線とし、該コイルの外周を断面形状が略長円形の筒状の絶縁カバーで覆い、該絶縁カバーの外面に前記平角銅線とは別の平角銅線を巻き回すことにより、低圧入力巻線としたことを特徴とするコイル部品。

【請求項3】請求項2において、前記絶縁カバーの巻芯方向の中央より端部側に、前記低圧入力巻線を巻いたことを特徴とするコイル部品。

【請求項4】請求項2または3において、前記筒状の絶縁カバーの外面に低圧入力巻線の巻き位置および端末引き出しのための位置決め用ガイドを設け、該位置決め用ガイドは、絶縁カバーの外側に突出させて形成され、

該位置決め用ガイドの中間部に低圧入力巻線の途中の部分を嵌める溝を有すると共に、該位置決め用ガイドの低圧入力巻線の巻芯方向の両端よりそれぞれ切り込み状に設けた横溝を有し、かつ該横溝から位置決め用ガイドの先端にわたり形成された縦溝を有し、低圧入力巻線端末は前記横溝および縦溝に嵌め込まれて固定されることを特徴とするコイル部品。

【請求項5】請求項2から4までのいずれかにおいて、前記高圧出力巻線として巻かれたコイルに、断面形状が該コイルの内周に合致する略長円形の棒状をなす高抵抗フェライトコアを、絶縁物を介せずに直接組み込むと共に、該棒状のコアの両端に、該コアを挟むように、コの字状のフェライトコアを設けたことを特徴とするコイル部品。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、薄帯状の平角銅線を用いたインダクタンス素子やトランス等のコイル部品に関する。

【0002】

【従来の技術】例えば高輝度放電灯等の点灯用の高圧トランスにおいては、高圧出力巻線に15kV以上の高電圧を発生させると共に、流れる電流も比較的大きい。従って、使用する線材の断面積をできるだけ大きくすると共に、耐電圧も確保する必要があることから、図6

(A)、(B)に示すように、樹脂製の円筒状のボビン30の周囲に、絶縁シート31を介して多層に巻線32を巻く構造や、分割ボビンを用いて巻線する構造(図示せず)により、電気的な仕様を確保するのが一般的であった。

【0003】一方、巻線を一層の整列巻きとすれば、薄

型化が図れるが、電流容量を大きくするために太い線材を用いると、コイル全体が長くなってしまふ。このため、図6(C)、(D)に示すように、ボビン30に細い線材33を複数層に巻き、並列接続する構造が考案された。

【0004】また、図6(E)、(F)に示すように、コイルを一層に巻線する構造については、平角銅線34を、ボビン30にその狭幅面が内周、外周となるようにエッジワイズ巻きにした構造も採用される。

10 【0005】

【発明が解決しようとする課題】図6(A)、(B)に示すように、各層毎に絶縁シート31を介在させる構造においては、製造工程が複雑であり、製造コストが高く、また薄型化には向かない形状である。

【0006】また、図6(C)、(D)に示すように、複数の細い線材33を複数層に巻き、各線材を互いに並列に接続する構造は、線材33の仕上がり径のばらつきによりコイルの幅が変化するため、ボビン30の巻芯方向の幅に余裕が必要となる。このため、二層目以降の層を巻く際、下層の巻線の仕上がり状態に左右され、巻乱れによる線材33の段落ちが発生し、レアショットの一因となる。また、同一巻線を複数層巻くため、巻線時間が非常にかかることとなり、コストアップの要因となる。また、薄型化が困難である。

【0007】また、図6(E)、(F)に示すように、平角銅線34を用いた場合にも、円形のコイルしか形成できず、薄型化が困難である。

【0008】本発明は、上記問題点に鑑み、従来のトランスやインダクタより薄型化を可能としたコイル部品を提供することにある。

30 【0009】

【課題を解決するための手段】請求項1のコイル部品は、平角銅線を用い、該平角銅線の狭幅面がコイルの内周、外周面となり、かつ、断面が略長円形となる筒状に形成したことを特徴とする。

【0010】このように、平角銅線を用いてその狭幅面が内周、外周面となるように巻回することにより、一層巻きでも巻数を稼ぐことができ、かつ断面積を確保して電流容量を持たせることができる。また、コイル形状を略長円形とすることにより、薄型化が達成できる。

【0011】請求項2のコイル部品は、トランスとして構成されるものであり、請求項1の断面形状が略長円形のコイルを高圧出力巻線とし、該コイルの外周を断面形状が略長円形の筒状の絶縁カバーで覆い、該絶縁カバーの外面に前記平角銅線とは別の平角銅線を巻き回すことにより、低圧入力巻線としたことを特徴とする。

【0012】このように、請求項1の薄型化されたコイルを高圧出力巻線として用いることにより、薄型化されたトランスを構成することができる。

50 【0013】請求項3のコイル部品は、請求項2におい

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て、前記絶縁カバーの巻芯方向の中央より端部側に、前記低圧入力巻線を巻いたことを特徴とする。

【0014】このように、低圧入力巻線を、絶縁カバーの中央より片側に片寄った部分に巻けば、この低圧入力巻線を巻いた側を高圧出力巻線の低圧側とすることにより、絶縁上の安全性が向上する。

【0015】請求項4のコイル部品は、請求項2または3において、前記筒状の絶縁カバーの外面に低圧入力巻線の巻き位置および端末引き出しのための位置決め用ガイドを設け、該位置決め用ガイドは、絶縁カバーの外側に突出させて形成され、該位置決め用ガイドの中間部に低圧入力巻線の途中の部分を嵌める溝を有すると共に、該位置決め用ガイドの低圧入力巻線の巻芯方向の両端よりそれぞれ切り込み状に設けた横溝を有し、かつ該横溝から位置決め用ガイドの先端にわたり形成された縦溝を有し、低圧入力巻線端末は前記横溝および縦溝に嵌め込まれて固定されることを特徴とする。

【0016】このような位置決めガイドを設ければ、低圧入力巻線を巻く場合、巻線の途中部分がガイドされると共に、両端の端末部分は、切り込み状の横溝に嵌め込んだ後、折り曲げ、縦溝にそって嵌め込むことにより、容易に絶縁カバーに巻回し固定することができる。

【0017】請求項5のコイル部品は、請求項2から4までのいずれかにおいて、前記高圧出力巻線として巻かれたコイルに、断面形状が該コイルの内周に合致する略長円形の棒状をなす高抵抗フェライトコアを、絶縁物を介せずに直接組み込むと共に、該棒状のコアの両端に、該コアを挟むように、コの字状のフェライトコアを設けたことを特徴とする。

【0018】このように、高圧出力巻線内に高抵抗フェライトコアを絶縁物を介せずに直接挿入する構造とすることにより、高圧出力巻線をより薄型化できる。また、U、Uコアを用いる場合のように、これらのコアを巻芯方向に固定するための固定手段が不要となり、その分小型化できる。

【0019】

【発明の実施の形態】図1(A)は本発明によるコイル部品の一実施の形態を示す端面図、図1(B)はそのD-D断面図、図1(C)は平角銅線の端面図である。3は平角銅線2を巻くことにより構成されたコイルである。該コイル3は、その巻芯に直交する切断面における断面形状が略長円形をなす。平角銅線2は、図1(C)に示すように、その狭幅面2a、2bがコイル3の内周、外周面となるように(エッジワイズに)巻かれる。

【0020】このように、平角銅線2を用い、コイルボビンを使用せずにその断面形状が略長円形となるようにコイル3を巻くことにより薄型化が達成できる。また、平角銅線2を用いているので、線材の断面積を確保でき、しかも巻数を確保することができ、巻芯方向の長さも短くすることができる。

【0021】図2(A)、(B)、(C)はそれぞれ上記コイル構造を用いて構成した本発明によるトランスの一実施の形態を示す平面図、正面図、側面図である。また、図3(A)はこのトランスの縦断面図、図3(B)は図3(A)のE-E断面図である。図3において、3は前述のように平角銅線2を断面が略長円形の筒状をなすように巻かれたコイルからなる高圧出力巻線である。

【0022】図2、図3において、4は樹脂製で、断面形状が略長円形の筒状をなす絶縁カバーであり、該絶縁カバー4は高圧出力巻線3を覆って取付けられる。該絶縁カバー4の両端には高圧出力巻線3の端子台4a、4bが一体に形成され、これらの端子台4a、4bには高圧出力巻線3の両端を接続する端子5、6が固定される。

【0023】高圧出力巻線3の外周には平角銅線となる低圧入力巻線7が、絶縁上の安全性の向上を図るため、絶縁カバー4の巻芯方向の中央より端部側に巻き回される。すなわち、高圧出力巻線3の低圧入力巻線7側が高圧出力巻線3の低圧側となる。なお、この低圧入力巻線7は複数回(本例においては2回)巻回され、本例においては、入力電圧が380V、出力電圧が24kVとなる場合について示している。

【0024】前記筒状の絶縁カバー4の外周には、低圧入力巻線7の巻き位置および端末引き出しのための位置決め用ガイド8を一体に設ける。該位置決め用ガイド8は、絶縁カバー4の外側に突出させて設けられる。該ガイド8の中間部には、前記低圧入力巻線7の中間部を嵌めて位置決めする溝8aが1個以上設けられる。また、該ガイド8の両端の根本部には、図4に示すように、低圧入力巻線7の端末を嵌め込んで位置決めする切り込み状の横溝8b、8cを有し、該各横溝8b、8cの根本部からガイド8の先端にかけて、縦溝8d、8eを形成している。これらの縦溝8d、8eは、それぞれ絶縁カバー4の外周の接線方向の面が開口するように、互いに反対側に向けて形成されている。低圧入力巻線7の端末は、まず横溝8b、8cに矢印Xで示すように嵌め込み、次に矢印Yで示すように縦溝8d、8eに嵌まるように曲げることにより、容易に固定される。

【0025】図3(A)において、9は前記高圧出力巻線3として巻かれたコイルに挿入された棒状コアである。本例のコア9は、断面形状が該コイルの内周形状よりわずかに小さい略長円形をなす。該コア9として高抵抗のフェライトコアを用いることにより、高圧出力巻線3との間に絶縁物を介せずに直接組み込むことができる。10は棒状のコアの両端に、該コアを挟むように、絶縁材11を介して取付けられて磁気回路を構成するコの字状のフェライトコアである。

【0026】図2に示すように、絶縁カバー4の両端には、コの字状のフェライトコア10の足部10a、10bを挟んで固定する挟持片4cが絶縁カバー4の両端に

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一対ずつ設けられる。

【0027】なお、絶縁カバー4とコア10との間には不図示の接着剤により固定され、さらに一般的には、低圧入力巻線7の端末7a、7bや高圧出力巻線3の端子5、6以外の部分是不図示の樹脂によりモールドされる。

【0028】図5(A)は本発明の他の実施の形態を示す断面図、図5(B)は図5(A)のF-F断面図であり、これは前記棒状コア9とコの字状のコア10の代わりに、2個のU字状の高抵抗のフェライトコア13、13を絶縁材14を介して組み合わせたものであり、他の構造は前述の通りである。この場合には、フェライトコア13、13を固定するための手段(図示せず)が必要となる。

【0029】図5の実施の形態と図3の実施の形態とを比較した場合、図3のように棒状コア9とコの字状のコア10とを組合わせることにより、図5の場合におけるコア13、13同士の固定手段が不要になり、その分全体形状を小型化できるという利点がある。

【0030】なお、本発明において、コイルの断面形状である略長円形の形状には、長円形に近似する例えば楕円形や小判形も含まれる。

【0031】

【発明の効果】請求項1によれば、平角銅線の狭幅面がコイルの内周、外周面となり、かつ、断面が略長円形となる筒状に形成したので、一層巻きでも巻数を稼ぐことができ、かつ断面積を確保して電流容量を持たせることができ、これにより小型化と、製造工程の簡略化が図れると共に、コイル形状を略長円形とすることにより、薄型化が達成できる。

【0032】請求項2によれば、請求項1の構造のコイルを高圧出力巻線とし、該コイルの外周を筒状の絶縁カバーで覆い、該絶縁カバーの外面に前記平角銅線とは別の平角銅線を巻き回すことにより、低圧入力巻線としたので、薄型化されたトランスを構成することができる。

【0033】請求項3によれば、請求項2において、前記絶縁カバーの長手方向の中央より端部側に、前記低圧入力巻線を巻いたので、この低圧入力巻線を巻いた側を高圧出力巻線の低圧側とすることにより、高圧出力巻線の高圧側と低圧入力巻線との沿面距離を大とすることができ、絶縁上の安全性が向上する。

【0034】請求項4によれば、請求項2または3において、前記筒状の絶縁カバーの外面に低圧入力巻線の巻き位置および端末引き出しのための位置決め用ガイドを設け、該位置決め用ガイドは、絶縁カバーの外側に突出させて形成され、該位置決め用ガイドの中間部に低圧入

力巻線の途中の部分に係める溝を有すると共に、該位置決め用ガイドの低圧入力巻線の巻芯方向の両端よりそれぞれ切り込み状に設けた横溝を有し、かつ該横溝から位置決め用ガイドの先端にわたり形成された縦溝を有し、低圧入力巻線端末は前記横溝および縦溝に嵌め込まれて固定されるようにしたので、低圧入力巻線を巻く場合、巻線の途中部分がガイドされると共に、両端の端末部分は、切り込み状の横溝に嵌め込んだ後、折り曲げ、縦溝にそって嵌め込むことにより、容易に絶縁カバーに巻回し固定することができる。

【0035】請求項5によれば、請求項2から4までのいずれかにおいて、前記高圧出力巻線として巻かれたコイルに、断面形状が該コイルの内周に合致する略長円形の棒状をなす高抵抗フェライトコアを、絶縁物を介せずに直接組み込むと共に、該棒状のコアの両端に、該コアを挟むように、コの字状のフェライトコアを設けたので、高圧出力巻線内に高抵抗フェライトコアを絶縁物を介せずに直接挿入する構造とすることにより、高圧出力巻線をより薄型化できる。また、U、Uコアを用いる場合のように、これらのコアを巻芯方向に固定するための固定手段が不要となり、その分小型化できる。

【図面の簡単な説明】

【図1】(A)は本発明によるコイル部品の一実施の形態を示す端面図、(B)はそのD-D断面図、(C)は本発明に用いる平角銅線の一例を示す端面図である。

【図2】(A)、(B)、(C)はそれぞれ上記コイル構造を用いて構成した本発明によるトランスの一実施の形態を示す平面図、正面図、側面図である。

【図3】(A)はこのトランスの縦断面図、(B)は(A)のE-E断面図である。

【図4】図2、図3の実施の形態における位置決めガイドを示す斜視図である。

【図5】(A)は本発明の他の実施の形態であるトランスの縦断面図、(B)は(A)のF-F断面図である。

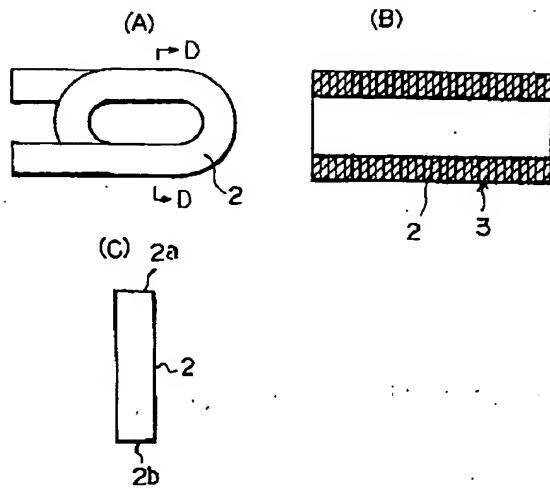
【図6】(A)は従来のコイル部品の一例を示す端面図、(B)はその断面図、(C)は従来のコイル部品の他の例を示す端面図、(D)はその断面図、(E)は従来のコイル部品の他の例を示す端面図、(F)はその断面図である。

【符号の説明】

1:ボビン、2:平角銅線、3:コイル(高圧出力巻線)、4:絶縁カバー、5、6:端子、7:低圧入力巻線、8:位置決め用ガイド、8a:溝、8b、8c:横溝、8d、8e:縦溝、9:棒状コア、10:コ字状コア、11、14:絶縁材、13:U字状コア

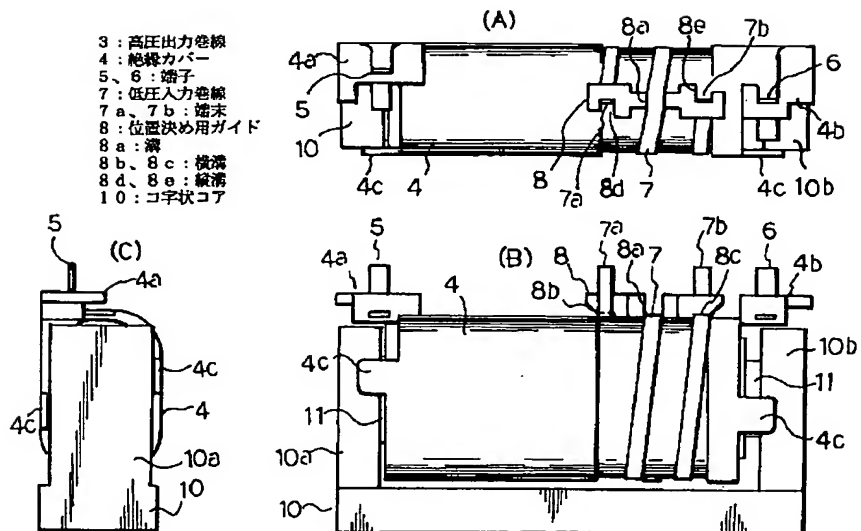
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【図1】



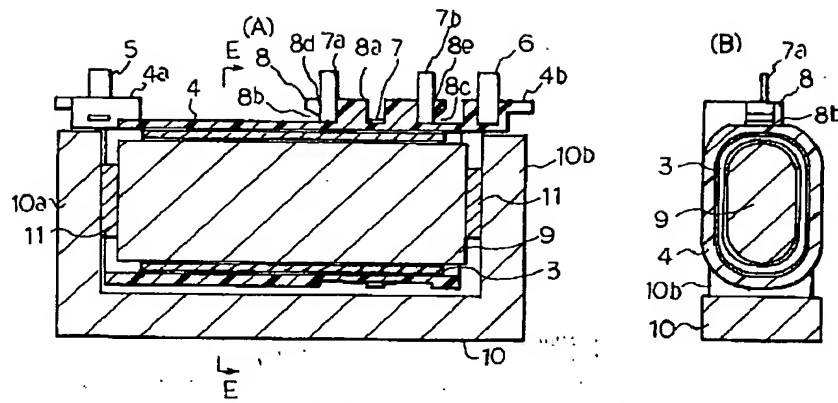
2: 平角銅線、3: コイル

【図2】



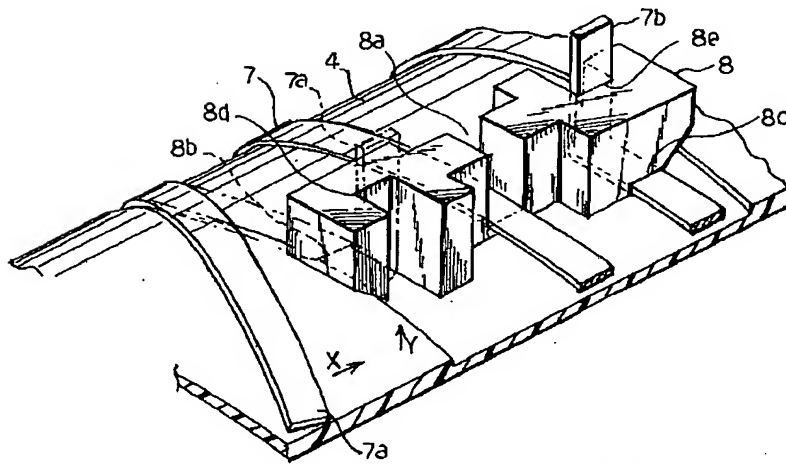
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【図3】



3: 高圧出力巻線、4: 絶縁カバー、5、6: 端子、7: 低圧入力巻線
 7a、7b: 端末、8: 位置決め用ガイド、8a: 溝、8b、8c: 横溝
 8d、8e: 縦溝、9: 棒状コア、10: コ字状コア、11: 絶縁材

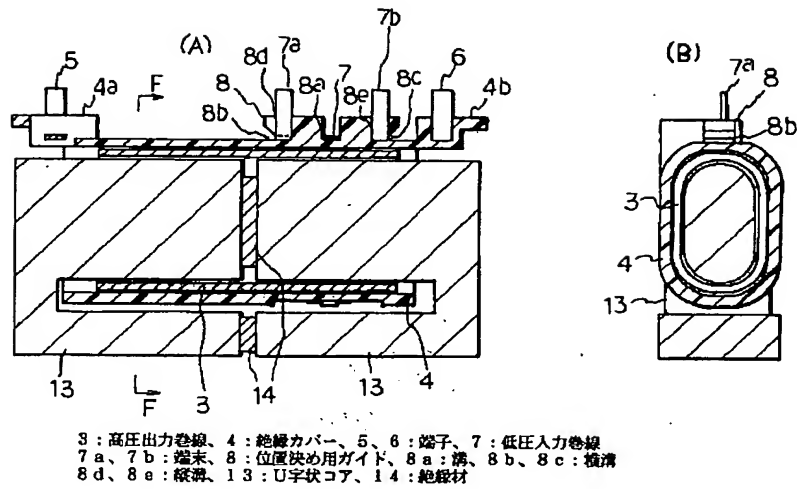
【図4】



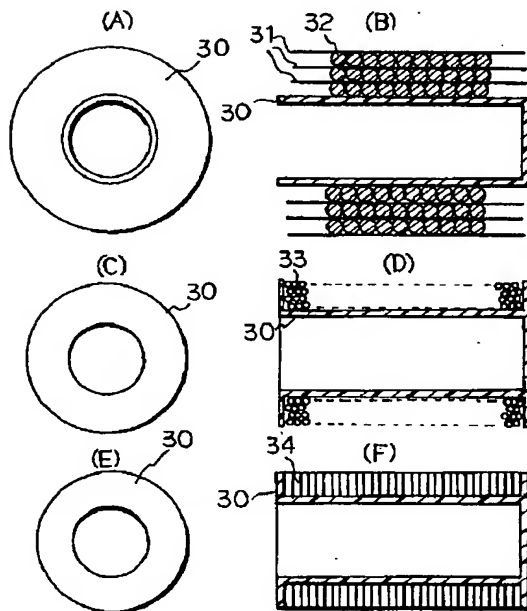
4: 絶縁カバー、7: 低圧入力巻線、7a、7b: 端末、8: 位置決め用ガイド
 8a: 溝、8b、8c: 横溝、8d、8e: 縦溝

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【図5】



【図6】



フロントページの続き

F ターム(参考) SE043 AA02 AB03 AB04 BA01 EA01
 EA05 EA06 EB01 EB02
 SE044 AD06 CA03 CA04 CA08 CB08
 DA01 DA03

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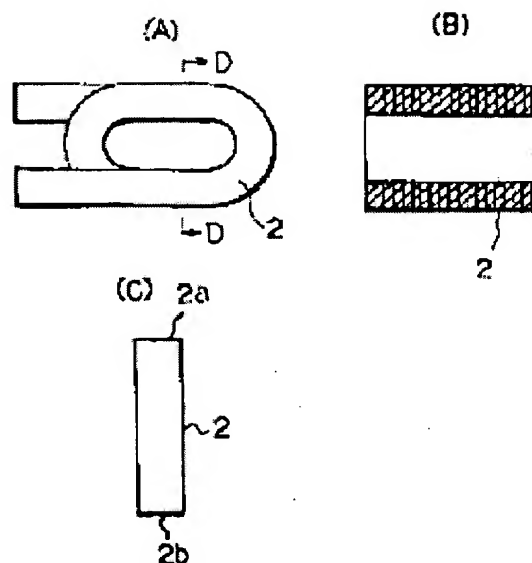
COIL PART

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Publication date: 2000-02-02
Inventor: KINOSHITA KENSUKE; KAWAMURA
Applicant: TDK CORP
Classification:
- international: H01F27/28; H01F27/26; H01F27/32
- european:
Application number: JP19980204665 19980721
Priority number(s):

Abstract of JP2000036416

PROBLEM TO BE SOLVED: To decrease the cost and to make it possible to form the thin configuration, by using a rectangular copper wire, making the narrow-width surface of this rectangular copper wire of the inner and outer surfaces of a coil, and providing the shape wherein the cross section is formed as the approximately elliptic shaped tube.

SOLUTION: A coil 3 is formed by winding a rectangular copper wire 2. The cross-sectional shape of the coil 3 at the cutting surface perpendicular with the winding core of the coil is made to be approximately elliptic shape. The rectangular copper wire 2 is wound so that the narrow widths 2a and 2b of the wire become the inner and outer surfaces of the coil 3 (edgewise). The rectangular copper wire 2 is attached by covering the high-voltage output winding with the insulating cover, whose cross section forms the approximately elliptic-shaped tube. At both ends of this insulating cover, the terminal stages of the high-voltage output winding is formed integrally. The terminal which connects both ends of the high-voltage output winding is fixed to the terminal stages. Then, the low-voltage input winding comprising the rectangular copper wire 2 is wound from the center to the end side in the direction of the winding core of the insulating cover at the outer surface of the high-voltage output winding.



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[Claim(s)]

[Claim 1] The coil component characterized by forming in tubed [from which the narrow-width side of this rectangular copper wire turns into inner circumference of a coil, and a peripheral face, and a cross section serves as an abbreviation ellipse] using rectangular copper wire.

[Claim 2] The coil component characterized by considering as a low voltage input coil by the cross-section configuration of claim 1 making the coil of an abbreviation ellipse a high-pressure output winding, and a cross-section configuration's covering the periphery of this coil with tubed insulating covering of an abbreviation ellipse, and coiling about a rectangular copper wire other than said rectangular copper wire around the external surface of this insulating covering.

[Claim 3] The coil component characterized by coiling said low voltage input coil around an edge side from the center of the direction of a winding core of said insulating covering in claim 2.

[Claim 4] In claims 2 or 3, the guide for positioning for the volume location of a low voltage input coil and a terminal drawer is prepared in the external surface of said tubed insulating covering. This guide for positioning While having the slot which the outside of insulating covering is made to project, is formed and inserts the part in the middle of a low voltage input coil in the pars intermedia of this guide for positioning It has the transverse groove prepared in the shape of slitting, respectively from the both ends of the direction of a winding core of the low voltage input coil of this guide for positioning. And it is the coil component which has the fluting formed over the tip of the guide for positioning from this transverse groove, and is characterized by inserting in and fixing a low voltage input coil terminal to said transverse groove and fluting.

[Claim 5] The coil component characterized by preparing the ferrite core of the shape of a character of KO in the both ends of the core of the shape of this rod so that this core may be pinched while the cross-section configuration included directly the high resistance ferrite core which makes the shape of a rod of the abbreviation ellipse corresponding to the inner circumference of this coil in either to claims 2-4 in the coil rolled as said high-pressure output winding, without minding an insulating material.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to coil components using a thin band-like rectangular copper wire, such as an inductance component and a transformer.

[0002]

[Description of the Prior Art] For example, in the high-pressure transformer for lighting of a high-intensity-discharge LGT etc., while making a high-pressure output winding generate the high voltage of 15kV or more, the flowing current is also comparatively large. Therefore, since

it was necessary to also secure withstand voltage while enlarging the cross section of the wire rod to be used as much as possible, as shown in drawing 6 (A) and (B), it was common to the perimeter of the bobbin 30 of the shape of a cylinder made of resin to have secured an electric specification through an insulation sheet 31 according to the structure of coiling a coil 32 at a multilayer, and the structure (not shown) which carries out a coil using a division bobbin.

[0003] On the other hand, the whole coil will become long, if a thick wire rod is used in order to enlarge current capacity although much more alignment volume, then thin shape-ization can plan a coil. For this reason, as shown in drawing 6 (C) and (D), the structure which rolls the thin wire rod 33 at two or more layers, and carries out parallel connection to a bobbin 30 was devised.

[0004] moreover, as shown in drawing 6 (E) and (F), about the structure which boils a coil further and carries out a coil, the structure which made rectangular copper wire 34 the edge WAIZU volume so that the narrow-width side might become a bobbin 30 with inner circumference and a periphery is also adopted.

[0005]

[Problem(s) to be Solved by the Invention] As shown in drawing 6 (A) and (B), in the structure of making an insulation sheet 31 intervening for each class, a production process is complicated, and a manufacturing cost is high, and it is the configuration which is not fit for thin shape-ization.

[0006] Moreover, as shown in drawing 6 (C) and (D), since the width of face of a coil changes with dispersion in the diameter of a result of a wire rod 33, allowances are needed [as for the structure of winding two or more thin wire rods 33 around two or more layers, and connecting each wire rod of each other to juxtaposition] for the width of face of the direction of a winding core of a bobbin 30. For this reason, in case the layer after a bilayer eye is rolled, it is influenced by the result condition of a lower layer coil, the gradation of the wire rod 33 by volume turbulence occurs, and it becomes the cause of rare short-circuit. Moreover, in order to coil the two or more layers same coil, coil time amount will be taken very much and causes a cost rise. Moreover, thin-shape-izing is difficult.

[0007] Moreover, as shown in drawing 6 (E) and (F), also when rectangular copper wire 34 is used, only a circular coil can be formed but thin-shape-izing is difficult.

[0008] This invention is to offer the coil component which enabled thin shape-ization from a conventional transformer and a conventional inductor in view of the above-mentioned trouble.

[0009]

[Means for Solving the Problem] The coil component of claim 1 is characterized by forming in tubed [from which the narrow-width side of this rectangular copper wire turns into inner circumference of a coil, and a peripheral face, and a cross section serves as an abbreviation

ellipse] using rectangular copper wire.

[0010] Thus, by winding so that the narrow-width side may turn into inner circumference and a peripheral face using rectangular copper wire, a volume can also earn number of turns further, and the cross section can be secured, and current capacity can be given. Moreover, thin shape-ization can be attained by making a coil configuration into an abbreviation ellipse.

[0011] The coil component of claim 2 is characterized by considering as a low voltage input coil by being constituted as a transformer, the cross-section configuration of claim 1 making the coil of an abbreviation ellipse a high-pressure output winding, and a cross-section configuration's covering the periphery of this coil with tubed insulating covering of an abbreviation ellipse, and coiling about a rectangular copper wire other than said rectangular copper wire around the external surface of this insulating covering.

[0012] Thus, the thin-shape-ized transformer can be constituted by using the coil with which claim 1 was thin-shape-ized as a high-pressure output winding.

[0013] The coil component of claim 3 is characterized by coiling said low voltage input coil around an edge side from the center of the direction of a winding core of said insulating covering in claim 2.

[0014] Thus, if a low voltage input coil is coiled around the part which inclined toward one side from the center of insulating covering, the safety on an insulation will improve by making into the low-tension side of a high-pressure output winding the side which coiled this low voltage input coil.

[0015] The coil component of claim 4 prepares the guide for positioning for the volume location of a low voltage input coil, and a terminal drawer in the external surface of said tubed insulating covering in claims 2 or 3. While having the slot which this guide for positioning makes the outside of insulating covering project, is formed, and inserts the part in the middle of a low voltage input coil in the pars intermedia of this guide for positioning It has the fluting which has the transverse groove prepared in the shape of slitting, respectively from the both ends of the direction of a winding core of the low voltage input coil of this guide for positioning, and was formed over the tip of the guide for positioning from this transverse groove, and is characterized by inserting in and fixing a low voltage input coil terminal to said transverse groove and fluting.

[0016] While a part will be guided in the middle of a coil when coiling a low voltage input coil if such a positioning guide is prepared, after inserting the terminal part of both ends in a slitting-like transverse groove, winding immobilization of it can be easily carried out by meeting and inserting in bending and a fluting at insulating covering.

[0017] In either to claims 2-4, the coil component of claim 5 is characterized by preparing the ferrite core of the shape of a character of KO so that the both ends of the core of the shape of this rod may pinch this core, while a cross-section configuration includes directly the high

resistance ferrite core which makes the shape of a rod of the abbreviation ellipse corresponding to the inner circumference of this coil in the coil rolled as said high-pressure output winding, without minding an insulating material.

[0018] Thus, -izing of the high-pressure output winding can be carried out [thin shape] more by making a high resistance ferrite core into the structure inserted directly, without minding an insulating material into a high-pressure output winding. Moreover, like [in the case of using U and U core], the fixed means for fixing these cores in the direction of a winding core becomes unnecessary, and can be miniaturized that much.

[0019]

[Embodiment of the Invention] The D-D sectional view and drawing 1 (C) of the end view and drawing 1 (B) which show the gestalt of 1 operation of the coil component according [drawing 1 (A)] to this invention are the end view of rectangular copper wire. 3 is the coil constituted by coiling rectangular copper wire 2. The cross-section configuration in the cutting plane to which the winding core and this coil 3 cross at right angles makes an abbreviation ellipse. As shown in drawing 1 (C), rectangular copper wire 2 is coiled so that the narrow-width side 2a and 2b may serve as inner circumference of a coil 3, and a peripheral face (to edge WAIZU).

[0020] Thus, thin shape-ization can be attained by rolling a coil 3 so that the cross-section configuration may serve as an abbreviation ellipse using rectangular copper wire 2, without using a coil bobbin. Moreover, since rectangular copper wire 2 is used, the cross section of a wire rod can be secured, moreover number of turns can be secured, and winding core lay length can also be shortened.

[0021] Drawing 2 (A), (B), and (C) are the top view showing the gestalt of 1 operation of the transformer by this invention constituted using the above-mentioned coil structure, respectively, a front view, and a side elevation. Moreover, drawing 3 (A) is drawing of longitudinal section of this transformer, and drawing 3 (B) is the E-E sectional view of drawing 3 (A). In drawing 3 , 3 is a high-pressure output winding which consists rectangular copper wire 2 of a coil rolled so that a cross section might make tubed [of an abbreviation ellipse] as mentioned above.

[0022] In drawing 2 and drawing 3 , 4 is a product made of resin, and a cross-section configuration is insulating covering which makes tubed [of an abbreviation ellipse], and this insulating covering 4 covers the high-pressure output winding 3, and is attached. The terminal blocks 4a and 4b of the high-pressure output winding 3 are formed in the both ends of this insulating covering 4 at one, and the terminals 5 and 6 which connect the both ends of the high-pressure output winding 3 are fixed to these terminal blocks 4a and 4b.

[0023] The low voltage input coil 7 which becomes the periphery of the high-pressure output winding 3 with rectangular copper wire is coiled around an edge side about from the center of the direction of a winding core of the insulating covering 4 in order to aim at improvement in

the safety on an insulation. That is, the low voltage input coil 7 side of the high-pressure output winding 3 turns into the low-tension side of the high-pressure output winding 3. In addition, multiple-times (it sets to this example and is 2 times).winding is carried out, and this low voltage input coil 7 shows the case where input voltage is set to 380V and output voltage is set to 24kV, in this example.

[0024] The guide 8 for positioning for the volume location of the low voltage input coil 7 and a terminal drawer is formed in the periphery of said tubed insulating covering 4 at one. The outside of the insulating covering 4 is made to project and this guide 8 for positioning is *****. One or more slot 8a which inserts in and positions the pars intermedia of said low voltage input coil 7 is prepared in the pars intermedia of this guide 8. Moreover, as shown in drawing 4 , it has the transverse grooves 8b and 8c of the shape of slitting which inserts in and positions the terminal of the low voltage input coil 7, it applies at the tip of a guide 8 from the root headquarters of each of these transverse grooves 8b and 8c, and Flutings 8d and 8e are formed in the root headquarters of the both ends of this guide 8. These flutings 8d and 8e of each other are formed towards the opposite side so that the field of the tangential direction of the periphery of the insulating covering 4 may carry out opening, respectively. It is easily fixed by inserting in the terminal of the low voltage input coil 7, as an arrow head X shows to transverse grooves 8b and 8c first, and bending so that it may fit into Flutings 8d and 8e,,as an arrow head Y shows below.

[0025] In drawing 3 (A), 9 is the cylindrical core inserted in the coil rolled as said high-pressure output winding 3. The core 9 of this example makes an abbreviation ellipse with a cross-section configuration slightly smaller than the inner circumference configuration of this coil. By using the ferrite core of high resistance as this core 9, it can incorporate directly, without minding an insulating material between the high-pressure output windings 3. 10 is the ferrite core of the shape of a character of KO which is attached in the both ends of a rod-like core through an insulating material 11 so that this core may be pinched, and constitutes a magnetic circuit.

[0026] As shown in drawing 2 , piece of pinching 4c fixed to the both ends of the insulating covering 4 on both sides of the feet 10a and 10b of the ferrite core 10 of the shape of a character of KO is prepared in the both ends of the insulating covering 4 a pair every.

[0027] In addition, it is fixed by non-illustrated adhesives between the insulating covering 4 and a core 10, and, still more generally the mold of the terminals 7a and 7b of the low voltage input coil 7, the terminal 5 of the high-pressure output winding 3, and the parts other than six is carried out with non-illustrated resin.

[0028] The sectional view in which drawing 5 (A) shows the gestalt of other operations of this invention, and drawing 5 (B) are the F-F sectional views of drawing 5 (A), this combines the ferrite cores 13 and 13 of high resistance of the shape of 2 character [U] through an insulating

material 14 instead of said cylindrical core 9 and core 10 of the shape of a character of KO, and other structures are as above-mentioned. In this case, the means (not shown) for fixing ferrite cores 13 and 13 is needed.

[0029] When the gestalt of operation of drawing 5 is compared with the gestalt of operation of drawing 3, by combining the cylindrical core 9 and the core 10 of the shape of a character of KO like drawing 3, the core 13 in the case of drawing 5 and the fixed means of 13 comrades become unnecessary, and there is an advantage that the whole part configuration can be miniaturized.

[0030] In addition, in this invention, for example, the ellipse form and ellipse which are approximated to an ellipse are also contained in the configuration of the abbreviation ellipse which is the cross-section configuration of a coil.

[0031]

[Effect of the Invention] Since it formed in tubed [from which the narrow-width side of rectangular copper wire turns into inner circumference of a coil, and a peripheral face, and a cross section serves as an abbreviation ellipse] according to claim 1, while a volume's also being able to earn number of turns further, and being able to secure the cross section, being able to give current capacity and being able to attain miniaturization and simplification of a production process by this, thin shape-ization can be attained by making a coil configuration into an abbreviation ellipse.

[0032] Since it considered as the low voltage input coil by making the coil of the structure of claim 1 into a high-pressure output winding, covering the periphery of this coil with tubed insulating covering, and coiling about a rectangular copper wire other than said rectangular copper wire around the external surface of this insulating covering according to claim 2, the thin-shape-ized transformer can be constituted.

[0033] According to claim 3, in claim 2, from the center of the longitudinal direction of said insulating covering, since said low voltage input coil was coiled around the edge side, by making into the low-tension side of a high-pressure output winding the side which coiled this low voltage input coil, the creeping distance of the high-tension side of a high-pressure output winding and a low voltage input coil can be made into size, and the safety on an insulation improves.

[0034] According to claim 4, in claims 2 or 3, the guide for positioning for the volume location of a low voltage input coil and a terminal drawer is prepared in the external surface of said tubed insulating covering. While having the slot which this guide for positioning makes the outside of insulating covering project, is formed, and inserts the part in the middle of a low voltage input coil in the pars intermedia of this guide for positioning It has the transverse groove prepared in the shape of slitting, respectively from the both ends of the direction of a winding

core of the low voltage input coil of this guide for positioning. And since it has the fluting formed over the tip of the guide for positioning from this transverse groove, a low voltage input coil terminal is inserted in said transverse groove and fluting and it was made to be fixed When coiling a low voltage input coil, while a part is guided in the middle of a coil, after inserting the terminal part of both ends in a slitting-like transverse groove, winding immobilization of it can be easily carried out by meeting and inserting in bending and a fluting at insulating covering.

[0035] According to claim 5, in either to claims 2-4, in the coil rolled as said high-pressure output winding While a cross-section configuration incorporates directly the high resistance ferrite core which makes the shape of a rod of the abbreviation ellipse corresponding to the inner circumference of this coil, without minding an insulating material Since the ferrite core of the shape of a character of KO was prepared in the both ends of the core of the shape of this rod so that this core might be pinched, -izing of the high-pressure output winding can be carried out [thin shape] more by making a high resistance ferrite core into the structure inserted directly, without minding an insulating material into a high-pressure output winding. Moreover, like [in the case of using U and U core], the fixed means for fixing these cores in the direction of a winding core becomes unnecessary, and can be miniaturized that much.

[Brief Description of the Drawings]

[Drawing 1] (A) is the end view showing an example of rectangular copper wire which uses for the D-D sectional view the end view showing the gestalt of 1 operation of the coil component by this invention, and (B), and uses (C) for this invention.

[Drawing 2] (A), (B), and (C) are the top view showing the gestalt of 1 operation of the transformer by this invention constituted using the above-mentioned coil structure, respectively, a front view, and a side elevation.

[Drawing 3] (A) is drawing of longitudinal section of this transformer, and (B) is the E-E sectional view of (A).

[Drawing 4] They are drawing 2 and the perspective view showing the positioning guide in the gestalt of operation of drawing 3 .

[Drawing 5] Drawing of longitudinal section of a transformer whose (A) is the gestalt of other operations of this invention, and (B) are the F-F sectional views of (A).

[Drawing 6] The end view in which the end view in which the end view in which (A) shows an example of the conventional coil component, and (B) show the sectional view, and (C) shows other examples of the conventional coil component, and (D) show the sectional view, and (E) shows other examples of the conventional coil component, and (F) are the sectional view.

[Description of Notations]

1: 11 A bobbin, 2:rectangular copper wire, 3:coil (high-pressure output winding), 4:insulation covering, 5, 6:terminal, 7:low voltage input coil, the guide for 8:positioning, a 8a:slot, 8b, a

8c:transverse groove, 8d, a 8e:fluting, a 9:cylindrical core, a 10:KO character-like core, 14 : an insulating material, a 13:U character-like core

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